DRV3204-Q1 EVM

This document is a supplement to the DRV3204-Q1 data sheet (SLVSBT3). It details the hardware implementation of DRV3204-Q1 evaluation module (EVM). This document does not cover the motor-driver application and the software.

Section 1 and Section 2 list the hardware descriptions of the EVM. Appendix A details getting started with the evaluation, and Appendix B describes the 3.3-V interface (I/F) board.

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1 Overview

1.1 Introduction

The DRV3204EVM is an application board to evaluate the DRV3204-Q1 device. The DRV3204-Q1 device is a field effect transistor (FET) pre-driver designed for a 3-phase brushless DC motor control. The EVM consists of the DRV3204-Q1 device, six N-channel MOSFETs, and passive devices. The DRV3204EVM has a 5-V level interface to communicate with an external micro-controller unit (MCU). A 3.3-V I/F board is also provided to support the 3.3-V MCU.

1.2 Block Diagram

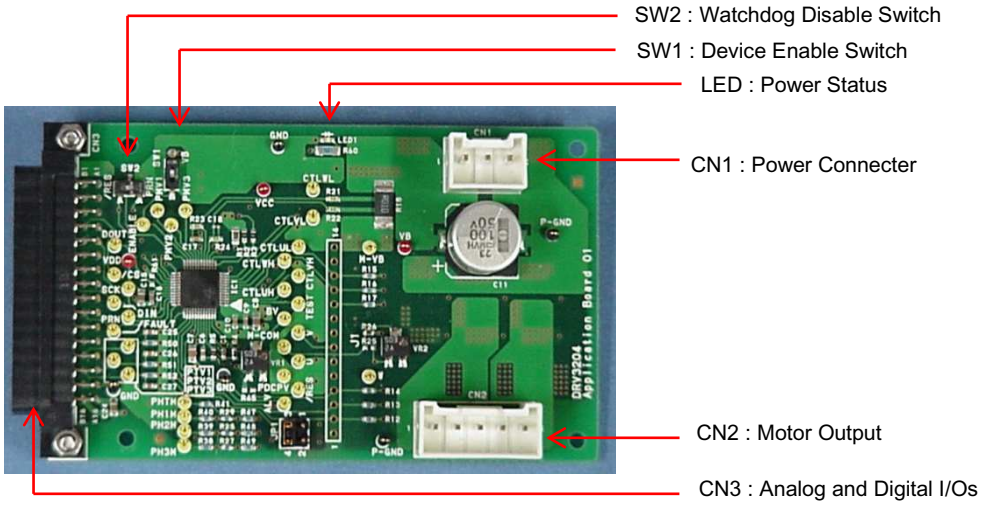

Figure 1. DRV3204EVM Board Layout (Front Side)

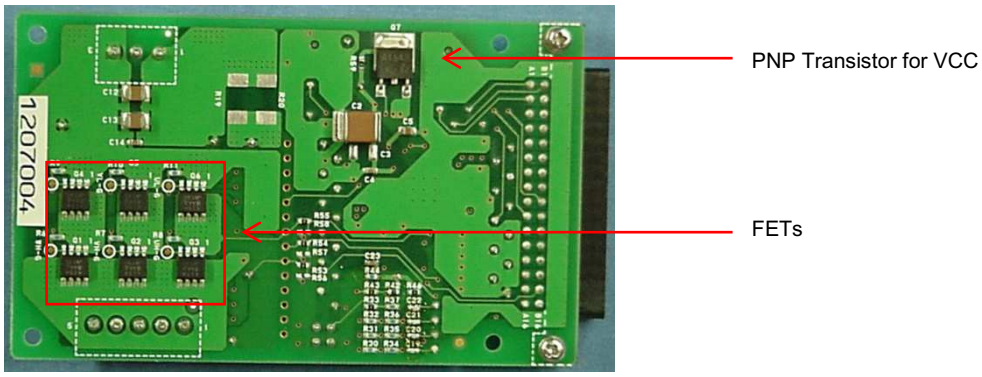

Figure 2. DRV3204EVM Board Layout (Back Side)

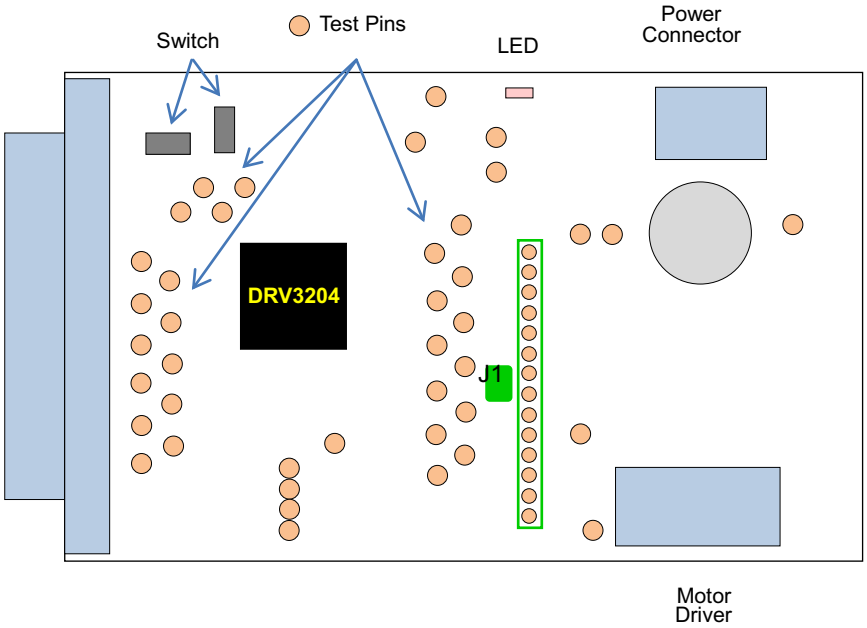

Figure 3. DRV3204EVM Block Diagram

1.2.1 Power and Communication Connectors

The EVM offers terminal blocks for the application of power and motor outputs, as well as digital input/output (I/O) and communication. This section briefly describes the functions. The pin assignments are described in Section 2.

1.2.1.1 Power Connector

The VB power rail (typically 12 V) must be externally supplied. The power for the external MCU and other analog and digital functions are supplied by the regulator implemented in the DRV3204-Q1 device.

1.2.1.2 Motor Outputs

A brushless DC Motor is connected to the EVM through the motor outputs.

1.2.1.3 Analog and Digital I/O

The analog and digital I/O and SPI communication of the DRV3204-Q1 can be used through the connector.

1.2.2 LED

The LED turns on when the DRV3204EVM power is supplied.

1.2.3 Switch

Switch1 is connected to the enable input (ENABLE) pin of the DRV3204-Q1. DRV3204-Q1 is enabled by turning this switch ON. Switch3 is for disabling the watchdog function. When you want to disable the watchdog function, this switch must be set to the $\overline{\text{RES}}$ position.

1.2.4 FETs

Six N-channel MOSFETs are implemented on the board to drive the brushless DC motor. A 10-A maximum brushless DC motor can be evaluated using this EVM board.

1.2.5 Test Pins

The DRV3204-Q1 pins are brought out to the test pin or test through-hole. For each test pin, a label on the silkscreen identifies the signal. Access the signals by using 14 through-holes, marked as J1.

2 Connectors and Switches

This section describes the pin assignment of the connectors and switches.

2.1 Connectors

2.1.1 CN1 – B3P-VH-FB-B(LF)(SN) (JST)

Table 1. Power Connectors

Pin#	Name	Description
1	VB	External power supply (typ 12-V, max 10 A)
2	NC	No connection
3	GND	Base ground (B-GND)

2.1.2 CN2 – B5P-VH-FB-B(LF)(SN) (JST)

Table 2. Motor Outputs

Pin#	Name	Description
1	Motor1	Motor terminal 1
2	NC	No Connection
3	Motor2	Motor terminal 2
4	NC	No Connection
5	Motor3	Motor terminal 3

2.1.3 CN3 – FCN-365J032-AU (Fujitsu Component)

Table 3. Analog and Digital I/O

Pin#	Name	Description
A1	PMV1	Phase comparator output 1
B1	PMV2	Phase comparator output 2
A2	PMV3	Phase comparator output 3
B2	PSS1	Sample and hold control signal input 1 (not used)
A3	PSS2	Sample and hold control signal input 2 (not used)
B3	PSS3	Sample and hold control signal input 3 (not used)
A4	$\overline{CS}$	SPI chip select signal input
B4	DOUT	SPI data signal output
A5	SCK	SPI clock signal input
B5	DIN	SPI data signal input
A6	CTLEN	Pre-driver parallel enable input (not used)
B6	CTLWL	Pre-driver parallel input
A7	CTLWH	Pre-driver parallel input
B7	CTLVL	Pre-driver parallel input
A8	CTLVH	Pre-driver parallel input
B8	CTLUL	Pre-driver parallel input

Table 3. Analog and Digital I/O (continued)

Pin#	Name	Description
A9	CTLUH	Pre-driver parallel input
B9	$\overline{\text{RES}}$	Reset output
A10	PRN	Watchdog timer pulse input
B10	FAULT	Diagnosis output
A11	$\overline{\text{OVCR}}$	Overcurrent reset input (not used)
B11	NC	No connection
A12	CANRX	CAN digital receive data output (not used)
B12	CANTX	CAN digital transmit data input (not used)
A13	NC	No Connection
B13	PTV1	Phase output 1
A14	PTV2	Phase output 2
B14	PTV3	Phase output 3
A15	GND	Ground
B15	ALV	Motor current sense amp output
A16	GND	Ground
B16	VCC	5-V VCC supply output

2.2 Switches

2.2.1 SW1

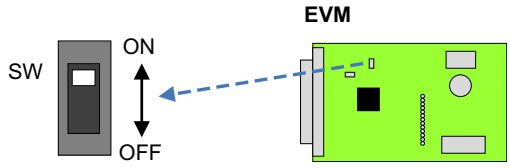

Figure 4. Device Enable Switch

Table 4. Device Enable Switch

Switch	Description
ON	DRV3204 ENABLE = VB DRV3204-Q1 is enabled
OFF	DRV3204 ENABLE = OPEN DRV3204-Q1 is disabled

2.2.2 SW2

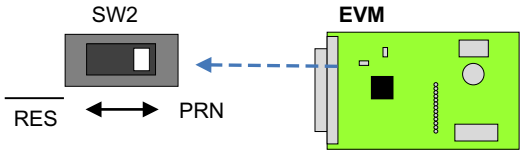

Figure 5. Watchdog Disable Switch

Table 5. Watchdog Disable Switch

Switch	Description
PRN	Watchdog function is enabled. It is controlled through the CN3 by MCU.
$\overline{\text{RES}}$	Watchdog function is disabled.

Appendix A Application Evaluation

This section gives an overview of an application evaluation environment. It uses an F28035 (C2000) Control Card and TI Code Composer Studio (CCS) to control and monitor the DRV3204-Q1 and motor-driver application.

A.1 Example of Evaluation Environment

Figure 6 shows a typical environment to evaluate the brushless DC motor system, Figure 7 shows the block diagram, and Table 6 lists the components.

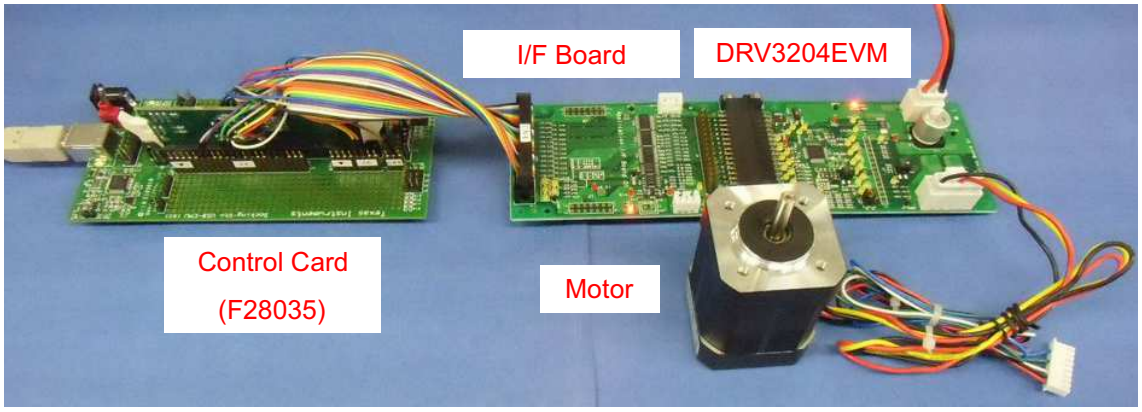

Figure 6. Example of Evaluation Environment

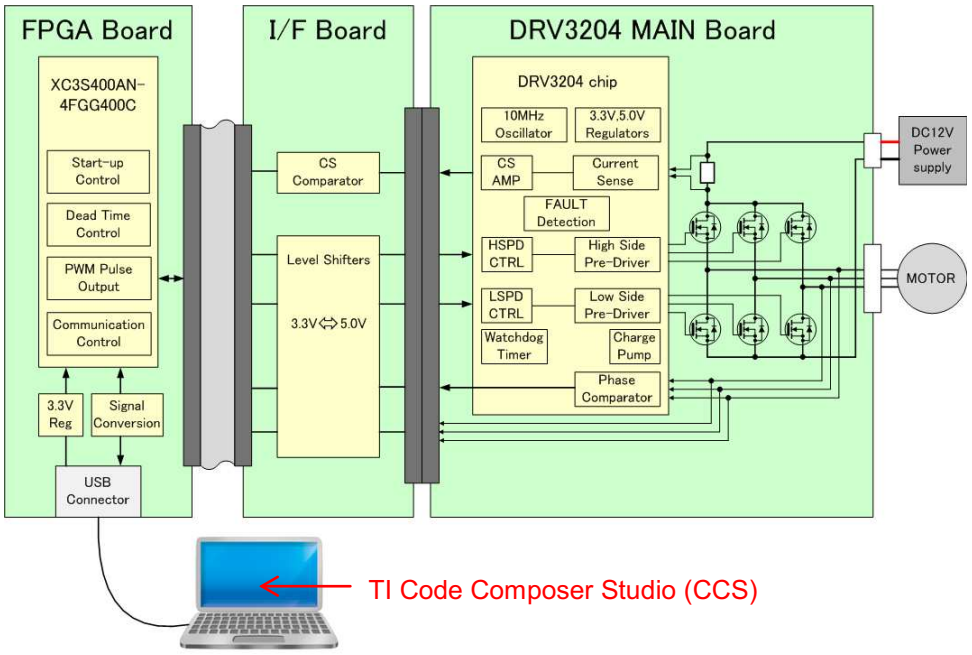

Figure 7. EVM Block Diagram

Table 6. Debugging Environment Example

Component	Description
CCS	CCS is the integrated development environment (IDE) for TI's micro-controllers. It provides a compiler of the user's code, a source code editor, a project build environment and real-time debugger.

Table 6. Debugging Environment Example (continued)

Component	Description
Control CARD	The Piccolo F28035 Control CARD is a TI 32-bit CPU suitable for motor-driver or power management applications.
I/F board	The I/F board converts the I/O voltage level between the Control CARD (3.3 V) and the DRV3204EVM (5 V).
MOTOR	A 3-phase brushless DC motor
Power supply	A 12-V power supply to EVM board

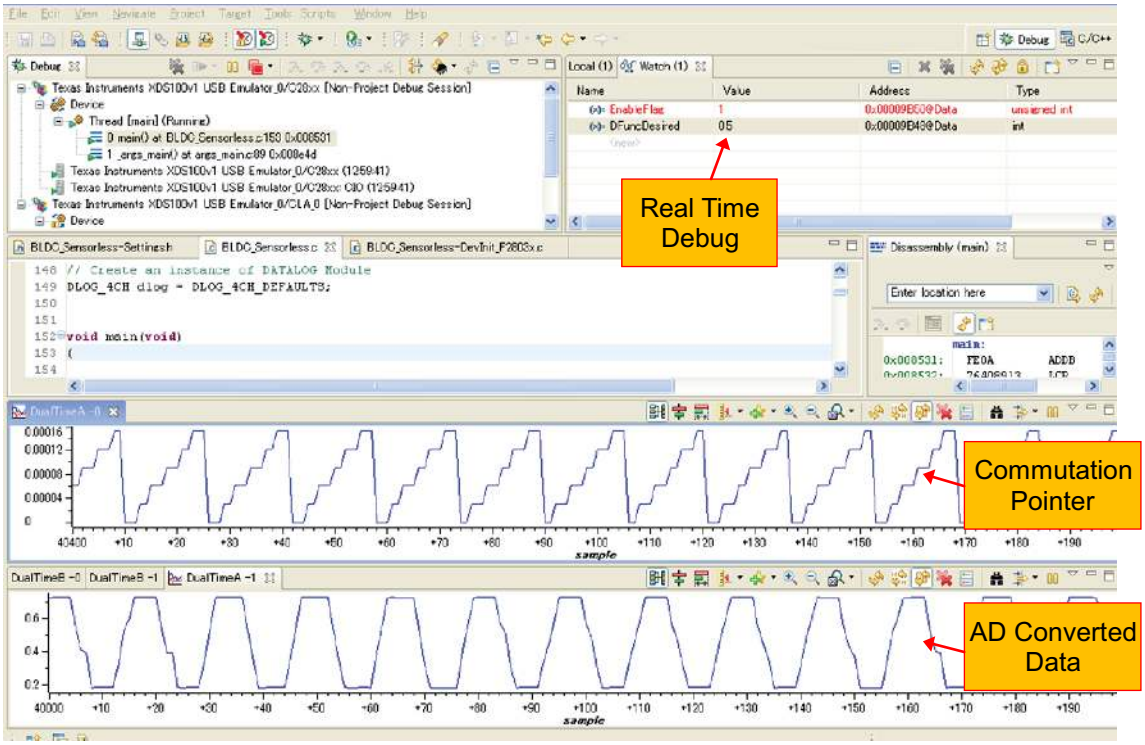

Figure 8. TI Code Composer Studio Screen Capture

The TI CCS offers real-time debugging with a C2000 MCU. It controls C2000 parameters or displays a motor-control status.

Appendix B I/F Board

B.1 I/F Board Overview

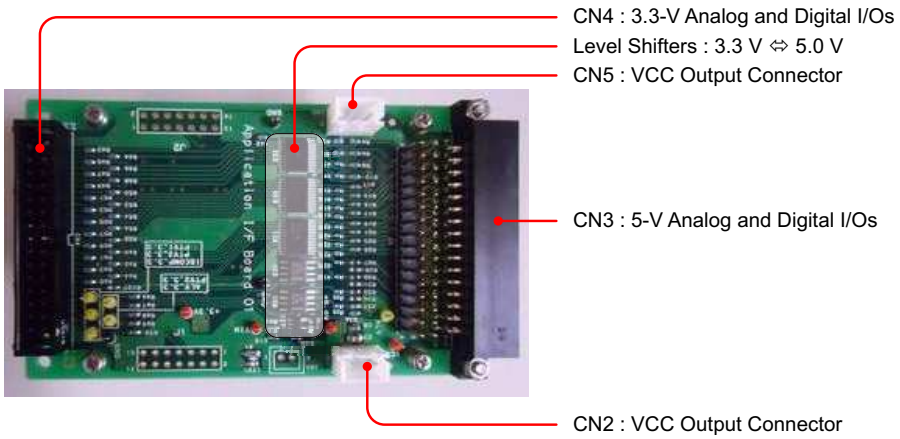

Figure 9. Board Layout (Front Side)

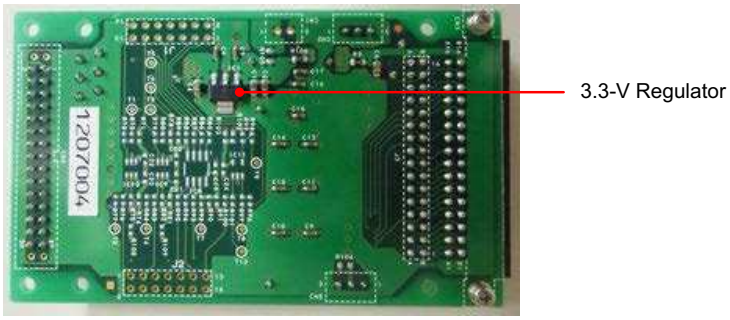

Figure 10. Board Layout (Back Side)

B.2 Connectors

B.2.1 CN1

Not used

B.2.2 CN2 and CN5 – B3B-XH-A(LF)(SN) (JST)

CN2 and CN5 are 5-V power supplies to components on the board or external devices.

Table 7. VCC Output Connector

Pin#	Name	Description
1	VCC	VCC power supply output
2	NC	No connection
3	GND	Ground

B.2.3 CN3 – FCN-365P032-AU (Fujitsu Component)

CN3 is a 5-V voltage level I/F connector, and It is connected on the DRV3204EVM.

Refer to Table 3.

B.2.4 CN4 – XG4C-3031 (omrom)

CN4 is a 3.3-V voltage level I/F connector, and it is used on the C2000 Control CARD.

Table 8. 3.3-V Analog and Digital I/O

Pin#	Name	Description
1	GND	Ground
2	ISCOMP	Current comparator output
3	ALV	Motor current sense amp output
4	PTV3	Phase amplifier output 3
5	PTV2	Phase amplifier output 2
6	PTV1	Phase amplifier output 1
7	NC	No connection
8	PRN	Pulse input
9	CTLUH	Pre-driver parallel input
10	CTLUL	Pre-driver parallel input
11	CTLVH	Pre-driver parallel input
12	CTLVL	Pre-driver parallel input
13	CTLWH	Pre-driver parallel input
14	CTLWL	Pre-driver parallel input
15	CTLEN	Pre-driver parallel enable input
16	DIN	SPI data signal input
17	SCK	SPI clock signal input
18	$\overline{CS}$	SPI chip select signal input
19	PSS3	Sample and hold control signal input 3 (not used)
20	PSS2	Sample and hold control signal input 2 (not used)
21	PSS1	Sample and hold control signal input 1 (not used)
22	$\overline{OVCR}$	Overcurrent reset input (not used)
23	CANTX	CAN digital input (not used)
24	CANRX	CAN digital output (not used)
25	FAULT	Diagnosis output
26	$\overline{RES}$	Reset output
27	DOUT	SPI data signal output
28	PMV3	Phase comparator output 3
29	PMV2	Phase comparator output 2
30	PMV1	Phase comparator output 1

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Caution

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Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

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No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or “enhanced plastic” are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have ***not*** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

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